vaporizer. In the current rapid start testing, at 30 seconds, when full reformate is being produced, the combustion side air flow rate was maintained at 1000 slpm while hydrogen was decreased over time to maintain the combustion inlet <1000C. The pressure drop across the reactor and vaporizer panels was 14 and 8 inches respectively under the high flow high temperature condition.

Several changes are planned to improve the current system performance. First, the reactor will be fabricated in an Inconel alloy to allow high temperature operation. This will reduce the thermal mass of the reformer to <⅓ of the current value. An additional 40% of the reactor mass is expected to be eliminated through design changes. The total air flow being used will be reduced by using higher combustion temperatures at lower air flow rates. The greater temperature driving force along with the reduced velocity on the combustion gas side will be utilized to reduce the air flow volume and pressure requirement during startup (as well as at steady-state). Current targets are that the startup air flow for a 50 kWe system will be in the 450-600 scfm flow range with a maximum pressure drop in the 5" to 10" H_2O range. The mechanical power input for a 75% efficient blower providing 600 scfm at 10" H_2O is 931 watts which places the air movement within reach of a conventional lead-acid automotive battery.

CLOSURE

While the invention has been illustrated and described in detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character. Only certain embodiments have been shown and described, and all changes, equivalents, and modifications that come within the spirit of the invention described herein are desired to be protected. Any experiments, experimental examples, or experimental results provided herein are intended to be illustrative of the present invention and should not be considered limiting or restrictive with regard to the invention scope. Further, any theory, mechanism of operation, proof, or finding stated herein is meant to further enhance understanding of the present invention and is not intended to limit the present invention in any way to such theory, mechanism of operation, proof, or finding.

Thus, the specifics of this description and the attached drawings should not be interpreted to limit the scope of this invention to the specifics thereof. Rather, the scope of this invention should be evaluated with reference to the claims appended hereto. In reading the claims it is intended that when words such as "a", "an", "at least one", and "at least a portion" are used there is no intention to limit the claims to only one item unless specifically stated to the contrary in the claims. Further, when the language "at least a portion" and/or "a portion" is used, the claims may include a portion and/or the entire items unless specifically stated to the contrary. Likewise, where the term "input" or "output" is used in connection with an electric device or fluid processing unit, it should be understood to comprehend singular or plural and one or more signal channels or fluid lines as appropriate in the context. Finally, all publications, patents, and patent applications cited in this specification are herein incorporated by reference to the extent not inconsistent with the present disclosure as if each were specifically and individually indicated to be incorporated by reference and set forth in its entirety herein.

What is claimed is:

1. A fluid processing device comprising:

a stack of thin sheets integrally bonded, the stack including alternating recessed sheets having aligned triangular first and triangular second header openings at two opposing ends of the stack, wherein the recesses in the sheets define a plurality of first microchannel flow paths between the first header openings at the two opposing ends of the stack and a plurality of second flow paths distinct from the first microchannel flow paths and between the second header openings at the two opposing ends of the stack,

wherein the aligned first and second header openings have a shape that generally defines at least three sides wherein two sides are substantially longer than a third side and wherein the two longer sides are relatively adjacent the first microchannel flow paths and the shorter side is relatively spaced from the first microchannel flow paths and generally perpendicular to a line connecting the openings at the two opposing ends of the sheets;

at least two support ribs adjacent to at least one of the two longer sides of the first header opening or the second header opening; and

at least one support structure located at an apex of the first header opening or an apex of the second header opening;

wherein the cumulative cross sectional area of the flow in an entrance region to the first microchannel flow paths is within about 20% of the cross sectional area of the flow in the first microchannel flow paths a substantial distance removed from the entrance region.

2. The fluid processing device of claim **1** wherein the aligned first and second header openings have a major axis that is generally parallel with a line connecting the openings at the opposing ends of the sheets.

3. The fluid processing device of claim **1** wherein the triangular first and second header openings have a height that is at least 2 times the length of the base.

4. The fluid processing device of claim **1** wherein the cumulative cross sectional area of the flow in the entrance region is within about 10% of the cross sectional area of the flow a substantial distance removed from the entrance region.

5. The fluid processing device of claim **1** wherein the device is a laminar flow heat exchanger capable of greater than 80% effectiveness between two equi-molar flows of air at 1 atm pressure where the pressure drop in each air stream is less than about 2.5 inches of water.

6. A fluid processing device comprising:

a stack of thin sheets integrally bonded, the stack including alternating recessed sheets having aligned triangular first and triangular second header openings at two opposing ends of the stack, wherein the recesses in the sheets define a plurality of first microchannel flow paths between the first header openings at the two opposing ends of the stack and a plurality of second microchannel flow paths between the second header openings at the two opposing ends of the stack,

wherein the aligned first and second header openings have a shape that generally defines at least three sides wherein two sides are substantially longer than a third side and wherein the two longer sides are relatively adjacent the first microchannel flow paths and the shorter side is relatively spaced from the first microchannel flow paths and generally perpendicular to a line connecting the openings at the two opposing ends of the sheets;

at least two support ribs bonded between each sheet and adjacent to at least one of the two longer sides of the first header opening or the second header opening; and

at least one support structure bonded between each sheet and located at an apex of the first header opening or an apex of the second header opening;

wherein

the cumulative cross sectional area of the flow in an entrance region to the first microchannel flow paths is